NVIDIA MELLANOX CONNECTX-6 DX
HPE ETHERNET SMARTNIC

NVIDIA® Mellanox® ConnectX®-6 Dx SmartNIC is the industry's most secure and advanced cloud network interface card to accelerate mission-critical data-center applications, such as security, virtualization, SDN/NFV, big data, machine learning, and storage. The SmartNIC provides up to two ports of 100 Gb/s and one port of 200 Gb/s Ethernet connectivity and delivering the highest return on investment (ROI) of any smart network interface card.

ConnectX-6 Dx is a member of NVIDIA Mellanox's world-class, award-winning ConnectX series of network adapters powered by leading 50 Gb/s (PAM4) and 25/10 Gb/s (NRZ) SerDes technology and novel capabilities that accelerate cloud and data-center payloads.

SECURITY FROM ZERO TRUST TO HERO TRUST

In an era where privacy of information is key and zero trust is the rule, ConnectX-6 Dx adapters offer a range of advanced built-in capabilities that bring security down to the endpoints with unprecedented performance and scalability, including:

> Probes & DoS Attack Protection – ConnectX-6 Dx enables a hardware-based L4 firewall by offloading stateful connection tracking through Mellanox ASAP[2] - Accelerated Switch and Packet Processing®.

> NIC Security – Hardware Root-of-Trust (RoT) Secure Boot and secure firmware update using RSA cryptography, and cloning-protection, via a device-unique secret key.

ADVANCED VIRTUALIZATION

ConnectX-6 Dx delivers another level of innovation to enable building highly efficient virtualized cloud data centers:

> Virtualization – Mellanox ASAP[2] technology for vSwitch/vRouter hardware offload delivers orders of magnitude higher performance vs. software-based solutions. ConnectX-6 Dx ASAP[2] offers both SR-IOV and VirtIO in-hardware offload capabilities, and supports up to 8 million rules.

> Advanced Quality of Service – Includes traffic shaping and classification-based data policing.

SmartNIC Portfolio

> 1/10/25/40/50/100 Gb/s Ethernet, PAM4/NRZ
> PCIe low-profile form factor
> QSFP56 connectors
> PCIe Gen 3.0/4.0 x16 host interface

Key Features

> Up to 100 Gb/s bandwidth
> Message rate of up to 215 Mpps
> Sub 0.8 usec latency
> Flexible programmable pipeline for new network flows
> ASAP[2] - Accelerated Switching and Packet Processing for virtual switches/routers
> Overlay tunneling technologies
> Hardware Root-of-Trust and secure firmware update
> Connection Tracking offload
> Advanced RoCE capabilities
> Best in class PTP for TSN applications
> GPUDirect® for GPU-to-GPU communication
> Host chaining technology for economical rack design
> Platform agnostic: x86, Power, Arm
> ODCC compatible

INDUSTRY-LEADING ROCE

Following the Mellanox ConnectX tradition of industry-leading RoCE capabilities, ConnectX-6 Dx adds another layer of innovation to enable more scalable, resilient and easy-to-deploy RoCE solutions.

> Zero Touch RoCE – Simplifying RoCE deployments, ConnectX-6 Dx allows RoCE payloads to run seamlessly on existing networks without requiring special configuration on the network (no PFC, no ECN). New features in ConnectX-6 Dx ensure resiliency and efficiency at scale of such deployments.

> Configurable Congestion Control – API to build user-defined congestion control algorithms, best serving various environments and RoCE and TCP/IP traffic patterns.

BEST IN CLASS PTP FOR TIME SENSITIVE APPLICATIONS

Mellanox offers a full IEEE 1588v2 PTP software solution as well as time sensitive related features called 5T45G (5T Time Triggered Transmission Technology for Telco). Mellanox PTP and 5T45G software solutions are designed to meet the most demanding PTP profiles. ConnectX-6 Dx incorporates an integrated Hardware Clock (PHC) that allows the device to achieve sub-20 usec accuracy while offering various timing related functions, including time-triggered scheduling or time-based SND accelerations (time based ASAP²). Furthermore, 5T45G technology enables software applications to transmit front-haul (ORAN) compatible in high bandwidth. The PTP solution supports slave clock, master clock, and boundary clock.

EFFICIENT STORAGE SOLUTIONS

With its NVMe-oF target and initiator offloads, ConnectX-6 Dx brings further optimization to NVMe-oF, enhancing CPU utilization and scalability. Additionally, ConnectX-6 Dx supports hardware offload for ingress/egress of T10-DIF/PI/CRC32/CRC64 signatures.

Solutions

> Cloud-native, Web 2.0, hyperscale
> Enterprise data-centers
> Cyber security
> Big data analytics
> Scale-out compute and storage infrastructure
> Telco and Network Function Virtualization (NFV)
> Cloud storage
> Machine Learning (ML) and Artificial Intelligence (AI)
> Media and Entertainment

ORDERING INFORMATION

Max Network Speed	Interface Type	Supported Ethernet Speeds [GbE]	Host Interface [PCIe]	NVIDIA Mellanox OPN	HPE OPN	HPE Product Description
2 x 100 GbE	QSFP56	1/10/25/40/50[1]/100[2]	Gen 4.0 x16	MCX623106AS-CDAT	P25960-B21	Mellanox MCX623106AS-CDAT Ethernet 100Gb 2-port QSFP56 Adapter for HPE
1 x 200 GbE	QSFP56	1/10/25/40/50[1]/100[2]	Gen 4.0 x16	MCX623105AC-VDAT	P10180-B21	Mellanox MCX623105AC-VDAT Ethernet 200Gb 1-port QSFP56 Adapter for HPE

1 50G can be supported as either 2x25G NRZ or 1x50G PAM4 when using QSFP56.
2 100G can be supported as either 4x25G NRZ or 2x50G PAM4 when using QSFP56.
> By default, the above products are shipped with a tall bracket mounted;
  a short bracket is included as an accessory.

FEATURES*

Network Interface
> 2 x 25/50/100 GbE

Host Interface
> PCIe Gen 4.0, 3.0, 2.0, 1.1
> 16.0, 8.0, 5.0, 2.5 GT/s link rate
> 16 lanes of PCIe
> MSI/MSI-X mechanisms
> Advanced PCIe capabilities

Virtualization/Cloud Native
> Single Root IOV (SR-IOV) and VirtIO acceleration
>> Up to 1 K VFs per port
>> 8 PFs
> Support for tunneling
>> Encap/decap of VXLAN, NVGRE, Geneve, and more
>> Stateless offloads for Overlay tunnels

Mellanox ASAP²
> SDN acceleration for:
>> Bare metal
>> Virtualization
>> Containers
> Full hardware offload for OVS data plane
> Flow update through RTE_Flow or TC_Flower
> OpenStack support
> Kubernetes support
> Rich classification engine (L2 to L4)
> Flex-Parser: user defined classification
> Hardware offload for:
>> Connection tracking (L4 firewall)
>> NAT
>> Header rewrite
>> Mirroring
>> Sampling
>> Flow aging
>> Hierarchial QoS
>> Flow-based statistics

Platform Security
> Hardware root-of-trust
> Secure firmware update

Stateless Offloads
> TCP/UDP/IP stateless offload
> LSO, LRO, checksum offload
> Receive Side Scaling (RSS) also on encapsulated packet
> Transmit Side Scaling (TSS)
> VLAN and MPLS tag insertion/stripping
> Receive flow steering

Advanced Timing & Synchronization
> Advanced PTP
>> IEEE 1588v2 (any profile)
>> PTP Hardware Clock (PHC) (UTC format)
>> 16 nsec accuracy
>> Line rate hardware timestamp (UTC format)
> Time triggered scheduling
> PTP based packet pacing
> Time based SDN acceleration (ASAP²)
> Time Sensitive Networking (TSN)

Storage Accelerations
> NVMe over Fabric offloads for target
> Storage protocols: iSER, NFSoRDMA, SMB Direct, NVMe-oF, and more
> T-10 Dif/Signature Handover

RDMA over Converged Ethernet (RoCE)
> RoCE v1/v2
> Zero Touch RoCE: no ECN, no PFC
> RoCE over overlay networks
> Selective repeat
> Programmable congestion control interface
> GPUDirect®
> Burst buffer offload

Management and Control
> PLDM for Monitor and Control DSP0248
> PLDM for Firmware Update DSP026
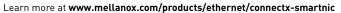> I²C interface for device control and configuration

Remote Boot
> Remote boot over Ethernet
> Remote boot over iSCSI
> UEFI support for x86 and Arm servers
> PXE boot

STANDARDS*

> IEEE 802.3cd, 50, 100 and 200 Gigabit Ethernet
> IEEE 802.3bj, 802.3bm 100 Gigabit Ethernet
> IEEE 802.3by, 25, 50 Gigabit Ethernet supporting all FEC modes
> IEEE 802.3ba 40 Gigabit Ethernet
> IEEE 802.3ae 10 Gigabit Ethernet
> IEEE 802.3az Energy Efficient Ethernet (supports only "Fast-Wake" mode)
> IEEE 802.3ap based auto-negotiation and KR startup
> IEEE 802.3ad, 802.1AX Link Aggregation
> IEEE 802.1Q, 802.1P VLAN tags and priority
> IEEE 802.1Qaz (ETS)
> IEEE 802.1Qbb (PFC)
> IEEE 802.1Qbg
> 25/50 Ethernet Consortium "Low Latency FEC" for 50GE/100GE/200GE PAM4 links
> PCI Express Gen 3.0 and 4.0

* This section describes hardware features and capabilities. Please refer to the driver and firmware release notes for feature availability.

Learn more at **www.mellanox.com/products/ethernet/connectx-smartnic**

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